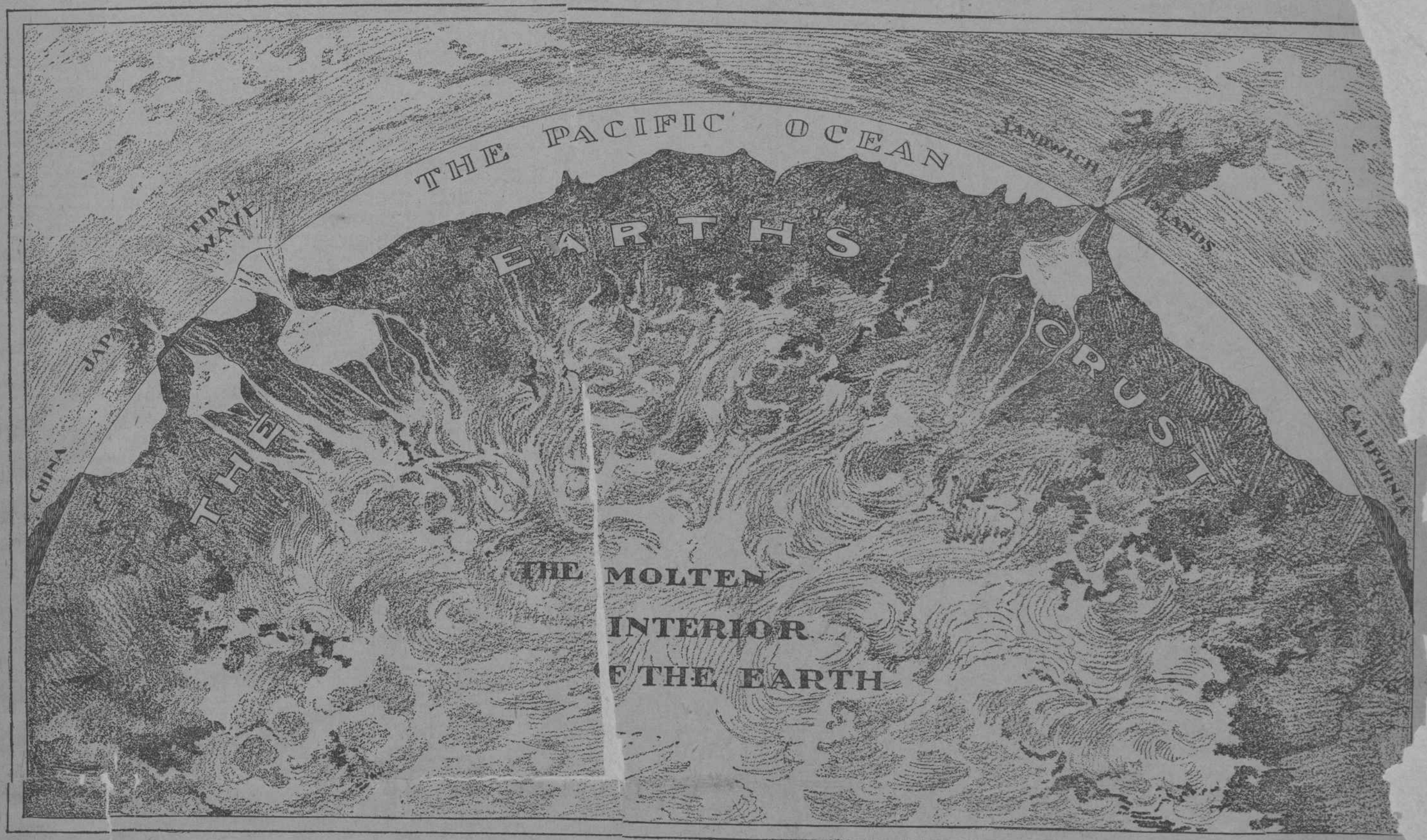
GREAT TIDAL WAVES AND THE MYSTERIES OF THE OCEAN'S BOTTOM.

Professor Davidson, of the Government Coast Survey, Writes of the Deep Sea Earthquakes Which Caused the Disaster in Japan.



PROFESSOR DAVIDSON'S THEORIES.

To W. R. Hearst, New York Journal:

The scientific world is only now beginning to gather reliable data of earthquake sources from many quarters, and the conditions for a proper investigation are often adverse. Speaking broadly, from a comparison of the effects of great earthquakes along the Andesan, Aleutian, Karile and Japanese chains of mountains, it may be safely asserted that the surface crust of the earth is under constant and immeasurable strain, arising from the gradual and inevitable contraction of the earth's inner mass and the irregular density and variable tensile strength of the materials near the surface. This contraction results from the dissipation of the earth's heat into space where the temperature is supposed to be not less than 492 degrees Fahrenheit below zero.

And by the earth's surface crust is here understood a thickness of not more than fifteen or twenty miles. The earth as a whole must have a rigidity equal to that of steel. The immediate surface is surely in ceaseless movement in a thousand places with forces ranging from the stupendous exhibition of Krakatato to the minute and telescopic exhibition, indicating a slight upheaval or depression. It is only within a very few years that abyssmal troughs of the ocean have been sounded. They are narrow and lie parallel and not far distant from the great mountain chains.

In the state of continuous strain there are interruptions exhibited by volcanic action and by earthquakes' action. Apparently they are not necessarily synchronous, nor even closely consequent. There are great exhibitions of either force without the other, or of both together. We have frequently such exhibitions in the great peninsula of Alaska and its prolongation through the Aleutian chain, where forty-seven living volcanoes may be in individual action without any earthquake exhibit, and where earthquakes occur without adjacent volcanic action.

Some exhibitions of earthquake forces are far away from areas of volcanic action as in the earthquakes of the Mississippi Valley in 1811, and the Charleston earthquake in 1886. Some exhibitions are peculiarly explosive, as that of 1797, which destroyed that of Krakatato already mentioned, and as the late exhibitions at New Bogoslo Island in the Bering Sea on a smaller scale.

But the greatest exhibitions of earthquakes are in the deep submarine troughs or valleys along the adjacent mountain chains, and unfortunately they can only be studied by the exhibition of their results on the shore. These ocean earthquakes very probably occur along the line of least resistance of the immediate earth surface, and this line is parallel to the crest lines of the mountain chain. This line of rupture may be local or very extended.

Sometimes it exhibits itself as an upheaval because the disturbance of the ocean surface reaches the shore as an incoming wave. Sometimes there must be a sudden breaking down of the earth's surface along that line, because the first effect along the shore is a recession of the ocean surface water. These cases of dislocation, notwithstanding the destructive effects of the water, may not be of great vertical depth, for in the greatest earthquakes along the western coast of South America in 1822 and 1835 there were upheavals of the land of only two to ten feet, although ancient geological upheavals indicate thousands of feet. In the Limoda (Japan) earthquake, of December, 1854, we had no report of any change of the elevation of the shore, nor have we any information about the changes caused in the last earthquake.

That these submarine earthquakes along the mountain chains are lines of rupture and not spots of upheaval, we can judge by well known lines of rupture in the earth's surface. The nearest to us here was the rupture in the Inyo earthquake of 1872. The recent Japanese earthquakes were clearly shown on the tide gauges of our coast and Vancouver Island. They were recorded also at the Hawaiian Islands.

GEORGE DAVIDSON,
Ex-Chief Pacific Division
U. S. Coast and Geodetic Survey.

Even so far east as the lakes of the United States have their mysterious volcanic powers of earth throw out preliminary warnings. On July there was a series of tidal waves along the western shore of Lake Michigan.

The water in the lake rose about warning more than three feet above its normal level. The highest wave was at 5:30 a. m., and from then on until 1 o'clock there was a succession of ebbs and flows about an hour apart, the like of which had never been seen before.

Professor Hough, of the northwestern University, could give no explanation of these phenomena. But other scientists, who have considered the Lake Michigan tidal waves as merely a part of seismic disturbances just now beginning to manifest themselves with a series, say the trouble lies in the

volcanoes, there is no crust at all. You can look down the crater, which is vomiting smoke, steam, lava and molten metals, and if your vision could follow these substances to their source you could look into the great central fires of the earth.

The whole interior of our globe is known to be in a molten condition, with intense fires that seem always renewing themselves, and which keep metals and stones forever in a liquid state. The flames from Vesuvius and other active volcanoes frequently illuminate the country for hundreds of miles. It is dangerous to approach the crater, because of the heat.

No thermometer could measure the intense heat of the great central fires of the earth, but it is believed by scientists that this heat is constantly varying. There are times when volcanoes, geysers, hot springs and other safety valves from the central furnace are quiescent.

At other times—and this appears to be one of them—all alike simultaneously show premonitory symptoms of activity. These are soon followed by destructive earthquakes, the disappearance of whole islands and even the making of new continents, as the wonder story of geology can tell.

A significant feature of the present disturbances is that they are either submarine or in the immediate neighborhood of great bodies of water. Around the Pacific all the volcanoes are more or less disturbed.

On the floor of that great body of water upheavals of untold magnitude have already taken place. If the crust of the earth, after slow contracting and cooling through periods of years, were to finally adjust itself on land, there would be an upheaval of a new chain of mountains and perhaps the formation of new volcanoes, and then peace would reign.

But if this adjustment of the outer crust of the earth takes place in the bed of the Pacific, as some scientists are now led to fear, then millions of tons of water would rush into the central, fiery cavity. The Pacific Ocean would instantly be turned into steam, and there would be an explosion whose magnitude no human mind can measure. The shattering of great stars and the breaking up of planets has been thus explained.

Upon a smaller scale precisely this occurrence is believed to have taken place as the cause of the immense and destructive tidal wave which swept the shores of Japan in the middle of June. A fissure had formed in the bottom of the ocean in the course of the slow cooling and contracting of the surface of the earth.

Into this fissure the waters of the Pacific percolated. There is no knowing how deep this fissure may have been. The presumption is, however, that it led down into some subterranean cavern, of which there are many under the bottom of the ocean. This in course of time filled with water.

From this subterranean cavern the fissure or crack in the earth penetrated downward to the great central fires of the earth. The latter are always seeking a means of egress, for the fires are explosive and expansive, and need safety valves, which volcanoes ordinarily supply. The fires in the centre of the earth will rush into any channel of escape that is opened to them.

Thus it is supposed by geologists that the flames and heat from the centre of the earth rushed into some fissure leading to a sac or cavity filled with water from the Pacific. The result was the generation of an immense body of steam.

The cavity was at once turned into a huge boiler, confined on all sides by rock and earth. All of the confined waters being turned to steam, the latter sought a means of escape along the lines of least resistance. The explosion which followed must of necessity have been upward to the bottom of the ocean.

The size and force of the Japanese tidal wave shows that an upheaval of vast magnitude and extent must have taken place. The ocean near Japan is deeper than in any other part of the world. This may be the reason why fishermen plying their work a few miles from the shore did not notice the recent huge tidal wave, except those near the place of explosion.

The tidal wave itself is believed to have been caused by a sudden uplifting of the bed of the ocean by volcanic force expended over a great extent of territory. The tidal wave was over three hundred miles in length, and the submarine explosion is supposed to have occurred a few miles out from the shore, but parallel with the latter for a long distance. Thousands of

ocean's bottom may have been suddenly lifted as if by a giant hand.

Those who saw the explosion from a distance describe the body of water thrown into the air as resembling a mountain, and at this point it may have been thousands of feet in height. Falling back to the surface, it created a gigantic "ripple," such as that produced by throwing a stone into a smooth sheet of water, and this extended in a widening circle in all directions. The Japanese coast was close at hand, and there the tidal wave broke with all its force, being succeeded by other smaller waves.

Large quantities of mud were thrown up, showing that the great wave swept the ocean's bottom. In deep water, where the fishermen were at work, the wave is believed to have been spread out, so that it passed beneath their boats unnoticed. But the rapidly shoaling water of the coast created an obstacle in its path that piled up its watery height, and added to its force and intensity. The wave ran at a speed greater than that of any railroad train. It took just eleven hours to cross the Pacific and lift the tidal gauges at San Francisco.

The whole Pacific Ocean is an immense volcanic basin. If you will look at a map of the world you will find that the coasts of the Pacific are marked by an almost continuous line of volcanoes. These fire mountains run up the east coast of Asia through the islands of Japan, cross over America by the Aleutian chain and run down the western edge of our own continent, continuing through Mexico and Central America and along the west shore of South America all the way to Cape Horn.

This wonderful chain of volcanoes, forming almost a great circle of the earth, marks the boundaries of the Pacific. Indeed, they seem to mark a huge crack in the earth's surface, owing to which a portion of the earth's crust has been lowered, thus forming the immense basin that is occupied by the waters of the Pacific.

One of the worst countries in the world for earthquakes is Chili, and submarine disturbances off that coast are often noticed. The land shakes as if with ague, and simultaneously the sea is seen several feet and rise again, a great wave or series of waves being precipitated on the coast. When a tidal wave starts from one edge of the Pacific it goes clear across the ocean.

Among the most remarkable tidal waves in history were those caused by the eruption of Krakatato twelve years ago. The island of Krakatato was situated in the Straits of Sunda, between Java and Sumatra. It was uninhabited, it area being fifteen square miles, and it had two lofty mountains, the taller one attaining an altitude of 2,000 feet above the sea.

On May 20, 1883, at 4 p. m., violent explosions were heard in Sumatra and Java, and early the next morning there was a much greater explosion, followed by a wave which swept away many villages along both shores of the straits, causing great loss of life. The material was thrown out in the shape of ashes and cinders, and ashes fell over all of Northern Java and southern Sumatra, covering that region with a pall of impenetrable darkness.

Shortly after noon on the same day, by one supreme convulsion, the subterranean powers burst prison walls with a terrific as to spread consternation among dwellers within a radius of 1,500 miles. Then the curtain of darkness finally began to clear off and light broke upon the scene, Krakatato was seen to be reduced to a fraction of its original size.

Where the volcano had been active a few hours before there was an expanse of sea fathomless with a 1,000 foot line. A portion of the island had been shot like a gigantic projectile 800 miles and dropped into the water, where it formed what is now known as Steers Island.

The final Titanic effort had lifted the greater part of Krakatato out by the roots, and hurling it through the air, had plunged it into the sea seven miles to the northeast. The waves produced by the great explosion went all the way around the world four times, as recorded by the tide gauges.

Volcanic eruptions are common at the bottom of the ocean. During the past century crews of vessels frequently reported seeing sulphurous smoke, flames and jets of steam rising out of the mid-Atlantic. Some scientists entertain the opinion that an archipelago is in process of formation in the midst of that great watery expanse.

In 1707 a new archipelago made its appearance snddenly in the Aegean Sea. Its uplifting was accompanied by volcanic eruptions, the waters in the neighborhood becoming by turns red, green, milk white and chemical blue. Mariners kept at a respectful distance for fear that the pitch between the planks of their vessels would melt in the water, which had attained a temperature of 170 degrees Fahrenheit.

In some oceans, particularly to the south of Japan, islands have a way of appearing and disappearing without notice. This sort of thing is apt to happen in the neighborhood of the Azores. Such a phenomenon usually begins with violent earthquakes.

Fire breaks out from the sea and rises in a cloud of steam, smoke and ashes, while vast quantities of lava and other volcanic stuff are vomited up. At length a group of rocks is uplifted, which grows until perhaps it covers a space of several miles in circumference.

On July 10, 1831, at a point thirty miles southwest of Sicily, a column of water sixty feet high and 800 feet in diameter was seen spouting up from the sea. A week later a small island had appeared, ejecting volcanic matter and clouds of vapor. The waters in the neighborhood were covered with floating cinders and dead fish.

Two weeks later the island had attained a height of 200 feet and a circumference of three miles. Several names were given it by mariners, who cruised around waiting to land upon it as soon as it was sufficiently cooled. Three nations claimed it, but before Europe had time to become embroiled in war over the matter the island vanished.

The Island of Luzon, in the Philippine archipelago, is frequently shaken by severe earthquakes. Four years ago there was a very disastrous disturbance of this kind which destroyed several villages. But the centre of the trouble seemed to be under water in the Strait of Bernardino, which divides the island of Lazor from the island of Samar.

Ships passing through the straits were in many cases jarred in such a way as to cause an alarm of shipwreck—as if their keels had grazed a sunken reef. Geyser-like waterspouts rose repeatedly from the sea to a height of 100 feet or more, when they subsided in a mist like the steam cloud of a submarine crater.

Some Curious Facts About Your Teeth.

THE largest tooth ever drawn from the jaw of a woman in the Greater New York was an eye tooth taken from Mrs. Bayne, of Brooklyn, by a Grand street dentist. The tooth was 2⅝ inches in length, and a special instrument had to be made to remove it.

Damp weather booms the dentist business.

The first false teeth were made on lead plates.

Miss Abee E. Ireland, of New York, was the first woman dentist.

People of the United States have the worst teeth of any nation.

Baltimore is known as the cradle of dentistry and has eight colleges.

Hippocrates, 450 B. C., was the first dentist of whom there is a record.

Gold-filled teeth are found in the jaws of skelefons exhumed at Pompeii.

A child is said to inherit the teeth of its father and the jaws of its mother.

Facial Neudalgia is sometimes due to a dead tooth, and may be cured by a dentist.

Big teeth and square jaws are always found with low foreheads and small craniums.

The substitution of porcelain filling for gold or amalgam is the dream of the dental scientist.

A Montana dentist's outfit consisted of stout twine, perforated bullets and a single-barrelled pistol.

Wetting a tooth brush and dipping it in salt will be found very effective in the removal of tartar.

The implantation of teeth is not yet a success. Not over one tooth in fifteen takes root and flourishes.

Imperfect teeth are a sure sign of civilization. Perfect teeth are found, as a rule, only among savages.

George Washington wore false teeth, and two sets of them are owned in Baltimore as valuable heirlooms.

The Talmud allowed Jewish women "to go abroad on the Sabbath with their false golden or silver teeth."

Dental science was utterly lost to the world for 1,000 years, or during the Dark Ages, and only revived in 1700.

Dr. Younger, of San Francisco, was the first dentist to successfully implant a human tooth into a patient's jaw.

Homer says that Aesculapius in 1200 B. C., used a narcotic when performing painful operations as tooth drawing.

Out of 100 teeth of adults that twenty-five years ago would have been ruthlessly extracted, 99 are now saved by science.

Women dentists have ceased to attract attention as a novelty, there being now over 400 of the sex engaged in the profession.

The Talmudical folk lore says: If a man dreams that his false teeth have fallen out it is an omen that his children will soon die.

Modern dentists can remedy crooked or projecting jaws by special appliances that gradually train the jaws into their normal position.

In China, while the dentist pulls the tooth an assistant stands by and drowns the lamentation of the victim in the noise of a large gong.

The American and European belle must have her teeth as white as pearls. The "pearls of the Orient" stain their molars a deep black with the betel nut.

The famous Mastral, who lived in the first century B. C., speaks of a Roman dentist, Calcellius, as "in the habit of fastening as well as extracting teeth."

The ancient Greeks used false teeth of sycamore wood, fastened to the sound teeth by ligatures of silver or gold in like manner to the bridge.

Filled teeth, crown and bridge work exhumed in various parts of Egypt, with ancient instruments, were shown in large numbers at the position.

Women detectives or "spotters" with decayed teeth were employed in New York to make cases against tooth-drawing by dentistry against the law.

Under the Mosaic regime the law of an eye for an eye was literally enforced, and the Lord High Executioner numbered official instruments.

A New York dentist, who puts gold fringes to the teeth of wealthy clientele to Newport during the season, where he prepared to fill or extract teeth while his patrons wait.

Electricity in motor form has robbed teeth filling of pain. The work is done in one-fourth of the time. The mallet, which, speed, is comparatively painless, when compared to the old process.

In ancient Egypt the art and practice of medicine was in the priesthood. Each priest adopted a specialty. Evidence has revealed in the opened tombs indicate that a high proficiency in at least one branch of dental art.